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Final Technical Status Report for DOTC-10-01-INIT524; Prototype Reactive Armor Fabrication (David Earl Cain Consulting)

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6. AUTHOR(S) **David Cain**

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David Earl Cain Consulting

8. PERFORMING ORGANIZATION REPORT NUMBER
11302011

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12. DISTRIBUTION / AVAILABILITY STATEMENT
No limit on distribution. Contacf Josiah Fay.

13. SUPPLEMENTARY NOTES
none

14. ABSTRACT
Development of mfg technology, materials, and production of composite armor, including: (6) C Kits, (1) B Kit, (1) upper and lower objective set was successfully complete.

15. SUBJECT TERMS
Armor

16. SECURITY CLASSIFICATION OF: U			**17. LIMITATION OF ABSTRACT** UU	**18. NUMBER OF PAGES** 6	**19a. NAME OF RESPONSIBLE PERSON** Josiah Fay
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** *(include area code)*

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

Final Technical Status Report

for

DOTC-10-01-INIT524; Prototype Reactive Armor Fabrication (David Earl Cain Consulting)

Initiative No. 2011-304

Reporting Period: 11 19 2010 – 11 30 2011

Ordnance Technology Initiative Team

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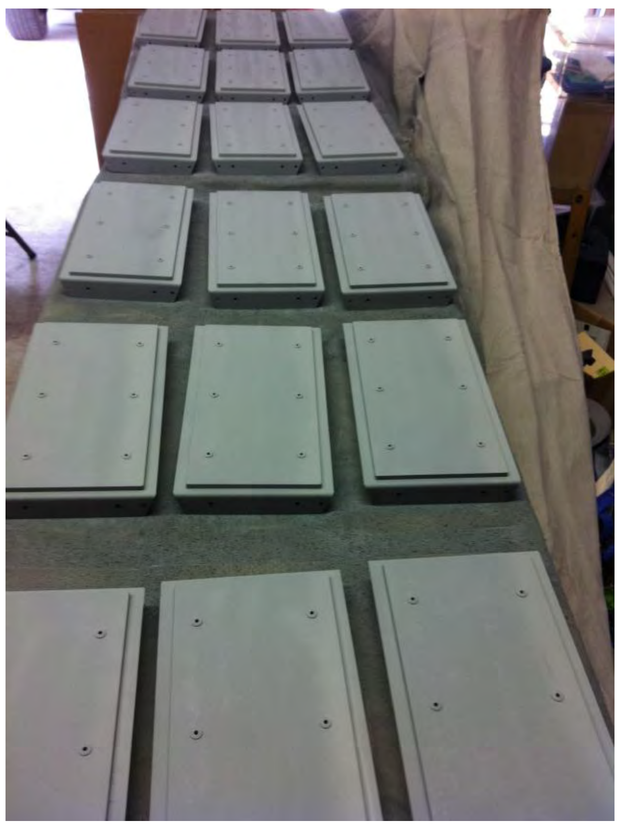
Submitted: 11 30 2011

1. **Comments on Technical/Cost/Schedule Performance**

Development of mfg technology, materials, and production of composite armor, including: (6) C Kits, (1) B Kit, (1) upper and lower objective set was successfully complete.

Objective Amor Upper and Lower Units

Production of half rails and (180) dummy cassettes was completed.



Production of LORA and Tile Housing Weldments was completed.

Initiative Quad Chart

<table>
<tr><td colspan="2">DOTC-10-01-INIT524; Prototype Reactive Armor Fabrication</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Goals & Objectives</td><td>Initiative Information</td></tr>
<tr><td>Milestones: 1a.1, 1a.2, 1b.1, 1b.2, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 13a, 14, 15a, 15b, 16, 17, 18, 19a, 20 are complete
All Reports</td><td>Initiative Lead: David Cain

Team Members: David Cain

Period of Performance: Start to 12 30 2011

Funding: $548,206</td></tr>
<tr><td>Milestones & Technical Achievements</td><td>Implementation & Payoff</td></tr>
<tr><td rowspan="2">Dec 2010: Kickoff Meeting
Jan 2011: Manufacturing Methods & Material Supplier Documentation
Feb 2011 Fabrication method for tiles
Mar-Nov 2011 Manufacturing</td><td>Schedule: 12 30 2011
Status: On schedule</td></tr>
<tr><td>Testing of Spectra Shield based Armor Tiles</td></tr>
<tr><td colspan="2"><u>Current Status:</u> Technical = Green/Yellow/Red (delta) Schedule = Green/Yellow/Red (delta) Cost = Green/Yellow/Red (delta)</td></tr>
</table>

***Current Status Legend*:** Green = Good/On Budget Yellow = Minor Weakness/Known Risk Red = Major Weakness/Critical
Delta: ⇧ = upgrade from last assessment; ⇩ = downgrade from last assessment; ⇨ = no change

Supplemental Information

3.1 Technical Achievements

Spectra-shield based composite armor and metallic fabrications are complete. No technical issues.

Milestone Status:

MS #	Deliverable	Due Date	Date Received	% Complete	Cumulative % Complete
1a.1	Phase 1: Tile Prototype Hardware manufacturing method panel	15-Feb-11	21-Mar-11	100	100
1a.2	Phase1: Tile Prototype hardware	30-Mar-11	21-Mar-11	100	100
1b.1	Phase 2: Tile prototype hardware based on changes required on outcome from milestone 1a.2	30-Apr-11	11-Apr-11	100	100
1b.2	Phase 2: Tile prototype hardware based on changes required on outcome from milestone 1a.2	31-May-11	11-Apr-11	100	100
2	Technical Interchange Meeting (TIM)	15-Dec-11			
3	Monthly Report	20-Jan-11	21-Mar-11	100	100
4	Task 2 Technical Report	31-May-11	11-Apr-11	100	100
5	Monthly Report	20-Feb-11	21-Mar-11	100	100
6	TIM	15-Dec-11			
7	Task 3 Final Technical Report Summary for Phase 1	15-Dec-11		100	100
8	Quarterly Technical and Business Status Report	20-Mar-11	21-Mar-11	100	100
9	Quarterly Technical and Business Status Report	20-Jun-11	21-Jun-11	100	100
11	Monthly Report	25-May-11	30-Jun-11	100	100
12	Phase 3: Task1: Identify material and sources	15-Dec-11	22-Nov-11	100	100
13	Phase3: Amor component Prototype manufacturing method sample	15-Jun-11	29-Jun-11	100	100
13A	Phase3: Amor component Prototype manufacturing method sample	15-Dec-11		100	100
14	Phase 3: prototype Armor component based on changes required on outcome from milestone 8a.2	30-Jun-11	29-Jun-11	100	100
15a	Phase 3: prototype Armor components based on changes required on outcome from milestone 8a.3	15-Jul-11	17-Aug-11	100	100
15b	Phase 3: prototype Armor components based on changes required on outcome from milestone 8a.3	15-Dec-11	22-Nov-11	100	100
16	Monthly Report	25-Jul-11	29-Aug-11	100	100
17	Phase 3: prototype Armor components based on changes required on outcome from milestone 8a.3	30-Jul-11	29-Jun-11	100	100
18	Monthly Report	25-Aug-11	29-Aug-11	100	100
19a	Phase 3: prototype Armor components based on changes required on outcome from milestone 8b.2 – Part 1	15-Dec-11		100	100
19b	Phase 3: prototype Armor components based on changes required on outcome from milestone 8b.2 – Part 2	15-Dec-11			
20	Quarterly Technical and Business Status Report	20-Sep-11		100	100
10	Final Technical and Business Status Report	30-Dec-11	22-Nov-11	100	100

Technical Readiness Level Status:

Current Technology Readiness Level (TRL) is (8)

Technology Readiness Levels in the Department of Defense (DOD) (Source: DOD (2006), *Defense Acquisition Guidebook*)	
Technology Readiness Level	**Description**
1. Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Example might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated	Invention begins. Once basic principles are observed, practical applications can be invented. The application is speculative and there is no proof or detailed analysis to support the assumption. Examples are still limited to paper studies.
3. Analytical and experimental critical function and/or characteristic proof of concept	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment	Basic technological components are integrated to establish that the pieces will work together. This is "low fidelity" compared to the eventual system. Examples include integration of 'ad hoc' hardware in a laboratory.
5. Component and/or breadboard validation in relevant environment	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so that the technology can be tested in a simulated environment. Examples include 'high fidelity' laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment	Representative model or prototype system, which is well beyond the breadboard tested for TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high fidelity laboratory environment or in simulated operational environment.
7. System prototype demonstration in an operational environment	Prototype near or at planned operational system. Represents a major step up from TRL 6, requiring the demonstration of an actual system prototype in an operational environment, such as in an aircraft, vehicle or space. Examples include testing the prototype in a test bed aircraft.
8. Actual system completed and 'flight qualified' through test and demonstration	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.

3.2 Problems Encountered and Action Taken

- Changes to the initiative objective or schedule. none
- Technical problems and approach to correct. Epoxy bonding of tiles at elevated temperature may cause tile deformation, room temperature bonding has been qualified with 24 hour cure required.
- Schedule problems and approach to correct. none

- Risks identified and mitigation plans. Water-jet cutting method is limited to either edge cutting or cutting that starts from a predrilled hole. The predrilled hole must be cut with a coring type drill, intended for paper cutting. Traditional drilling creates a separation of the tile composite sheets. Water-jet plunge cutting also creates separation of the tile composite sheets. Actual material slips some at Honeywell during press operations and some edge waste is created.

3.3 Technology Transfer

- none

3.4 Plans for Next Quarter

- Complete

Thank you

David Cain

David Cain, DEC Consulting,